

## **Washable Protective Pad**

The present application is a continuation-in-part of U.S. application ser. no. 10/685,647, filed on October 15, 2003, entitled "Washable Protective Pad," attorney docket 2820/101, itself a continuation-in-part of U.S. application ser. no. 10/273,985, filed on October 18, 2002, entitled "Washable, Protective Hip Pad Construction," each of which is incorporated herein by reference.

### **Technical Field**

The present invention relates to protective anatomical pads that may be worn to guard against injuries from impact or pressure.

### **Background**

What might be a minor injury to a young person might constitute a serious trauma to an elderly or infirm person. Injuries to the hip are a relatively common and important case in point. Protective pads have been provided for incorporation in patch pockets of underbriefs for elderly and/or infirm men and women. These patch pockets and the protective pads they contain cover the hip bones and overlap adjacent anterior and posterior regions, particularly of the buttocks. Such patch pockets position the protective pads to protect against physical shock due to inadvertent falling or other physical contact. For this purpose, one example of a protective pad of the prior art is a thin assemblage that comprises a hermetically sealed plastic envelope and an open cell foam insert contained freely therein. In a particular prior art example, the envelope is in the form of a thin film, composed for example of polyurethane backed by nylon fabric, and the insert is in the form of a thin solid foam stratum having an internal phase composed of open cells of air, and an external phase composed of elastomeric polyurethane.

The pad should be sufficiently flexible for comfort. On impact at any point or region of the

pad, air inside the insert and in the space between the insert and the envelope distributes the force of the impact and reduces its intensity at the impact point. A problem with such pads has been a tendency of the insert to crumple and/or roll up during the tumbling that occurs when the garment and pad are machine washed. Specifically, when the insert is not substantially fully extended within the envelope but is crumpled into a mass, the product may become unwearable.

### **Summary of the Invention**

In a first embodiment of the invention there is provided a washable protective pad. The pad is constructed from overlaid sheets joined by a seal to form an air impermeable envelope. A compressible insert is disposed at least partially within the chamber formed by the envelope. Part of the seal joining the overlaid sheets holds the insert, reducing movement of the insert with respect to the envelope. This arrangement permits the pad to maintain its shape and protective attributes after repeated washings. In a specific embodiment of the invention, the surface of the insert is also stuck to the inner surface of the envelope through adhesive or thermoplastic adhesion or other means.

In another embodiment of the invention, a compressible insert is disposed within the chamber formed by overlaid sheets. The seal between the overlaid sheets of the envelope does not capture the insert. Part of the surface of the insert is stuck to the inner surface of the envelope through adhesive or thermoplastic adhesion or by other means. In this embodiment of the invention, movement of the insert with respect to the envelope is reduced by adhesion of the insert to the envelope wall, allowing the pad to maintain its shape and protective attributes after multiple washings.

In a further embodiment of the invention, a single sheet is folded upon itself with the edges of the sheet sealed to form an air impermeable envelope. A compressible insert is disposed at least partially within the chamber formed by the envelope. The insert may be captured by the seal that joins the edges of the sheet and/or the surface of the insert may be stuck to the walls of the chamber.

In another embodiment of the invention, a method is provided to protect an individual from a force. The force may be an impact from a fall or pressure from a mattress for a bed-ridden individual or any other force. A protective pad according to any of the

above embodiments is incorporated into a garment worn by the individual. The pad may be incorporated by insertion into a pocket in the garment or by attaching the pad to the garment or by other means. The pad is disposed between the portion of the individual's anatomy to be protected and the site where the force may impact the individual.

#### **Brief Description of the Drawings**

The foregoing features of the invention will be more readily understood by reference to the following detailed description, taken with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a hip pad according to an embodiment of the present invention;

Fig. 2 is a view of a washable underbrief that incorporates a pair of washable hip pads in accordance with an embodiment of the present invention;

Fig. 3 is an exaggerated cross-sectional view of the hip pad of fig. 1, taken along the lines 3-3 of Fig. 1;

Fig. 4 is an exaggerated cross-sectional view, analogous to that of fig. 3, illustrating details of another embodiment of the present invention;

Fig. 5 is an exaggerated cross-sectional view, analogous to that of fig. 3, illustrating details of a further embodiment of the present invention;

Figs. 6A-6C illustrate several configurations of the insert captured by part of the seal; and

Fig. 7 is an exaggerated cross-sectional view, analogous to that of fig. 3, illustrating an insert partially captured by a seal that joins the sheets.

#### **Detailed Description of Specific Embodiments**

Note that, as used in this description and the accompanying claims unless the context otherwise requires, the word "part" will take its normal meaning as meaning at least a portion but less than the whole. Likewise, the words "air impermeable" will have its

ordinary meaning in the context of protective padding: an air impermeable envelope or enclosure will be air tight during the duration of an impact that might be sustained by the enclosure in normal use. For example, the envelope described in example I below is considered “air impermeable.” Further, as used in this description and the accompanying claims, unless the context otherwise requires, “washable” as applied to a protective pad will have its ordinary meaning as a pad that is capable of being repeatedly machine washed without damage.

In embodiments of the present invention, a washable pad protects part of a human’s anatomy, such as a hip, from a force. For example, the force may be an impact from striking a surface during an accidental fall. Another exemplary force is pressure from a mattress or from a wheelchair seat for an infirm individual, which may lead to bedsores. The pad is constructed to allow multiple washings while maintaining its shape and its protective features.

For example, in an embodiment of the present invention, as illustrated in figs. 1 to 2, an underbrief 20 has a pair of opposed patch pockets 22 and 24. Each pocket extends over a hip and overlaps regions of the body that are anterior and posterior with respect to the hip. Confined within and extending throughout the pockets are washable, protective pads 26 and 28. While each pad illustrated is round, pads in other shapes, such as oval or rectangular may be used. Generally, the area and thickness of the pad may be less than 90 square inches and less than 1 inch, respectively, so that the pad may be worn comfortably. In other embodiments of the invention, the pad may be any size, shape and thickness necessary to protect an area of the body.

A washable protective pad may be made in a variety of constructions according to embodiments of the invention. As shown in fig. 3, a protective pad 26 generally comprises an external envelope 30 and an insert 32. The envelope is impermeable to air and may be made of any suitable material, such as plastic or a coated nylon fabric. The envelope may be advantageously formed from separate sheets that are sealed together, at least at their edges, or may be made from a single sheet that is folded upon itself and sealed at its edges. The seal that joins the sheets may be adhesive or thermoplastic molding or a weld, such as a radiofrequency induced weld, or another sealing technique suitable for the materials forming the envelope. Preferably, the external envelope and the insert are substantially coextensive.

The inner surface of the walls of the envelope defines an inner area, which may be a laminar region 38 as shown in fig. 3, or a chamber of any arbitrary shape. Insert 32 may be an open cell, solid foam having a laminar configuration that extends substantially throughout inner laminar region 38 in contiguity with the opposed inner faces of walls 34 and 36. In other embodiments of the invention a wide range of compressible materials may be used for the insert. The insert preferably is also resilient, so that the pad may sustain multiple impacts and maintain its protective function.

In embodiments of the present invention, the insert may be attached to the envelope at one or more points so that the disposition of the insert with respect to the envelope may be substantially maintained when the pad is washed. Thus, the pad will retain its wearability and protective function throughout its lifetime. As shown in fig. 3, the edges of the envelope may be sealed together as at 40 and 42 throughout their peripheries, providing an outwardly extending peripheral flange shown at 44 and 46. In the embodiment of the invention shown in fig. 3, no part of the flange or seal between the faces of the envelope holds the insert – movement between the insert and the envelope is reduced by sticking the insert to the inner walls of the envelope

Figs. 3-5 show embodiments of the invention in which the surface of the insert is bonded to the inner wall of the envelope. The bonds between the surface of the insert and the inner surface of the envelope walls may be made by any convenient technique, such as by gluing or by thermoplastic melting or by other techniques as are known in the art. As shown in figs. 3-5, the opposed faces of the insert 32 are generally contiguous with, i.e. in free contact with or slightly spaced from, the inner faces of walls 34 and 36 at cleavage regions 35 and 37. Insert 32 is bonded to the inner face of wall 36 by four spot junctions 48, 50, 52 and 54, which are located equidistantly around the circumference of the envelope, as shown in fig. 1.

Another embodiment of the invention is shown in fig. 4. Here, the envelope walls are shown at 56 and 58 as being bonded around their periphery, as at 60 and 62. Within the envelope is an insert 64. One face of insert 64 is bonded to the inner face of wall 56 by four spot junctions, two of which are shown at 66 and 68. The other face of insert 64 is bonded to the inner face of wall 58 by four spot junctions, two of which are shown at 70 and 72.

A further embodiment of the invention is shown in fig. 5. Here, the envelope walls are shown at 76 and 78 as being sealed around their periphery, as at 80 and 82. Within the envelope is an insert 84. One face of insert 84 is connected to the inner face of wall 78 by a junction in the form of a bonding stratum 86 between the contiguous faces of insert 84 and wall 78. The other face of insert 84 is free.

In other embodiments of the invention, the seal, which joins the sheets or the portions of a single sheet that comprise the air impermeable envelope, captures and holds the insert. The seal may be made preferably by radio-frequency induced welding or by other joining techniques as are known in the art. This technique for holding the insert may be used alone or in combination with sticking the insert to the wall of the chamber formed by the envelope, as illustrated by figs. 3-5. The insert may be held by any part of the seal or by the entire seal. The seal may be contiguous, in a manner similar to the flange shown in figs. 1 and 3 or may be any combination of spot or strip seals. When the seal between the faces of the envelope captures the insert, movement between the insert and the envelope is reduced, maintaining the disposition between the envelope and the insert, when the pad is worn or laundered.

By way of example, insert 132 may be circular in shape with tabs 170 extending from the body of the insert, as shown in the top-down partial view in fig. 6A. These tabs may be captured in the seal 140, 142 (shown as the area between dotted lines) as the seal is joined. Alternatively, the insert may be circular in shape and the diameter of the insert may be such that the insert edge 150 is captured by the seal around the periphery of the pad, as shown in fig. 6B. The edge of the insert 150 may be beveled so that the portion of the insert captured by the seal is thin, facilitating an air-tight seal. As shown in fig. 6C, the insert may be circular in shape with a diameter such that the seal around the periphery does not capture the insert, but spot seals 180 adjacent to the peripheral seal do capture the insert. Other arrangements of seals with various size, shapes and placements may be made and all such arrangements are intended to be within the scope of the invention as described in the appended claims. Fig. 7 shows a cross-sectional view of the pad for the configuration of fig. 6B. The pad may have a thin space 138 between insert 132 and envelope wall 130.

The following non-limiting examples further illustrate embodiments of the present invention.

### EXAMPLE I

In the example of the assemblage illustrated in fig. 3, details of the various components are as follows. Each of the envelope walls is composed of a laminate having an outer fabric stratum and an inner thermoplastic stratum. The insert is composed of an open cell solid foam having an internal air phase and an external thermoplastic phase. Preferably, the inner thermoplastic stratum of each wall and the external phase of the insert are composed of essentially the same thermoplastic, for example, polyurethane. Preferably, the fabric stratum is composed of a textile produced from a high melting point plastic (450° F.) sold by DuPont™ under the trade designation, "NYLON". The fabric typically is in the range of from 50 to 200 denier, and preferably is approximately 70 denier. The thickness of the laminate of each wall ranges from 1 to 6 mils and preferably is approximately 3 mils.

### EXAMPLE II

In furtherance of EXAMPLE I, the junctions are formed by welding together the thermoplastic faces of the walls throughout their perimeters, and spot welding the walls to the insert at a temperature above the softening point of polyurethane and under a pressure necessary to achieve coalescence and integration of the polyurethane surfaces. Typically, the diameter of each of the spot welds range from 1/2 to 1-1/2 inch, and preferably no greater than 1 inch. In essence the diameters of the junctions are limited to preserve lateral flexibility and free flow of air between the open cells of the insert and the adjacent cleavage regions.

### EXAMPLE III

In the embodiment of fig. 4, the materials of the walls and the insert are respectively identical to their counterparts in fig. 3. However, here there are two sets of four equidistantly spaced junctions. Two of the junctions of one of the sets are shown at 66 and 68 between insert 64 and wall 56. Two of the junctions of the other of the sets are shown at 70 and 72 between insert 64 and wall 58.

### EXAMPLE IV

In the embodiment of fig. 5, the materials of the walls and the insert are respectively identical to their counterparts in fig. 3. Here, chemical bonding is achieved with a flexible

polymeric adhesive, preferably a flexible polyurethane adhesive. As shown, one of the faces of insert 84 is bonded by flexible polyurethane adhesive stratum 86 to the inner face of wall 78. The other of the faces of insert 84 is free for the purpose of maintaining flexibility. Also, the two walls 76 and 78 are bonded by flexible polyurethane adhesive throughout their peripheries as shown at 80 and 82.

### APPLICATION

In embodiments of the invention, a protective pad as described in any of the preceding embodiments may be incorporated into any garment worn by an individual. The pad may be inserted into a pocket or may be attached to the garment, such as by fasteners made of Velcro™ or by other suitable fasteners. For example, a suitably-sized pad may be incorporated into pajamas for a bed-ridden subject. The pad is attached to the pajamas so that as the subject lies in bed the pad serves to cushion the subject's skin from pressure due to gravity acting on the bed's mattress. Bedsores and other skin irritations may be avoided. As another example, the pad may be inserted into a pocket in underbriefs, as shown in fig. 2, and may protect an individual from hip injury should an accidental fall occur.

Surprisingly, we have found that, although an envelope that is generally suitable for incorporation into a protective pad may be fabricated from a coated nylon fabric, abrasive wear from the coarse weave of the nylon in a garment carrying the pad can render the garment unwearable, as when such wear causes one or more holes in the garment to develop allowing the pad to slip out of the garment. Accordingly, we have found it desirable to use an unsupported plastic film for the envelope. Many plastic films, however, are unsuitable for this purpose because: (1) the plastic film's melting point is so low that the film cannot survive washing and drying in an ordinary laundry in a garment with the pad, (2) the film employs plasticizers that migrate out of the film leading to early deterioration and/or (3) the film has other unsuitable physical characteristics. We have found that use of an unsupported polyurethane film, such as, for example, unsupported polyurethane films from manufacturers such as American Poly Film, Inc., Deerfield Urethane, Inc. and Omniflex, can address these problems. Thus, in preferred embodiments of the invention, including in any of the embodiments described above, the film sheets included in the enclosure may advantageously be an unsupported polyurethane film.

### WATER-IMPERMEABLE PROTECTIVE PADS

As used in this description and the accompanying claims unless the context otherwise requires, the term “water-impermeable” will have its ordinary meaning in the context of protective padding: a “water-impermeable” envelope or enclosure will be liquid tight to water and other liquid solutions that may be encountered during normal use in a protective pad including repeated machine laundering while incorporated in a garment.

In preferred embodiments of the present invention, a protective pad is constructed that includes an envelope or enclosure with a compressible insert. The enclosure is water-impermeable: the pad enclosure does not admit water or other liquid solutions that could be encountered in normal use, e.g. water, urine, saliva, detergent, blood, or various beverages that may be spilled, etc. Further, the pad enclosure must not admit liquids during repeated machine washings and dryings. To spread the force of an impact, the air inside the enclosure must be substantially retained inside the enclosure during an impact such as that produced by a human falling on the pad, but substantial air transfer may occur over a longer period of time or under greater force on the enclosure. Such an embodiment of the invention may be made, for example, by introducing a pinhole or other small fissure into the enclosure of any of the embodiments described above. All such embodiments are within the scope of the invention as described by the appended claims.